PENGEMBANGAN BUKU AJAR PREKURSOR ALAMI GEMPA BUMI UNTUK MENINGKATKAN LITERASI DAN KESIAPSIAGAAN BENCANA MAHASISWA PENDIDIKAN IPA

DISERTASI

Diajukan untuk Memenuhi Sebagian dari Syarat untuk Memperoleh
Gelar Doktor Pendidikan Ilmu Pengetahuan Alam

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2021

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Universitas Pendidikan Indonesia, 2021

Sebuah Disertasi yang diajukan untuk memenuhi salah satu syarat memperoleh gelar Doktor Pendidikan (Dr.) pada Program Studi Pendidikan Ilmu Pengetahuan Alam

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Pengembangan Buku Ajar Prekursor Alami Gempa Bumi untuk Meningkatkan Literasi dan Kesiapsiagaan Bencana Mahasiswa Pendidikan

ABSTRAK

Agenda global tentang *Sustainable Development Goals* (SDGs) dan *Hyogo Framework Action* (HFA) merefleksikan tingginya tuntutan untuk penyelenggaraan pendidikan kebencanaan untuk mencapai tujuan mensejahterakan kehidupan masyarakat dunia pada tahun 2030. Sumatera Barat merupakan wilayah dengan resiko bencana gempa bumi sangat tinggi namun implementasi program pendidikan Pengurangan Resiko Bencana (PRB) belum maksimal di Perguruan Tinggi, diindikasikan rendahnya level literasi bencana dan kesiapsiagaan bencana mahasiswa. Penyebabnya adalah ketersediaan sumber literatur perkuliahan yang kontekstual dan memuat pengetahuan kearifan lokal kebencanaan masih terbatas. Salah satu solusinya adalah penyediaan sumber belajar yang mendukung implementasi pendidikan dasar kebencanaan. Mengakomodasi peran potensial sains dan pendidikan sains untuk kebencanaan, penelitian ini bertujuan menghasilkan buku ajar prekursor alami gempa bumi (BA PAG). Penelitian pengembangan buku ajar menggunakan metode penelitian pengembangan dengan disain DDR (*Design and Development Research*) terdiri dari 3 tahap utama yaitu *front end analysis, planning* dan *production* yang terdiri dari 17 kegiatan. Secara keseluruhan, penelitian dilaksanakan di Sumatera Barat pada 2 sub-lokasi, yaitu Program Studi Pendidikan IPA FMIPA Universitas Negeri Padang dan empat daerah rawan bencana di Sumatera Barat. Pengumpulan data menggunakan berbagai teknik (observasi, survei, wawancara, analisis literatur, dan tes) dan instrumen (lembar observasi, kuisioner, pedoman wawancara, daftar cek, dan tes) yang valid. Analisis data menggunakan 2 teknik, yaitu statistik deskriptif (perhitungan persentase, penentuan N-*gain*, Indeks Kesiapsiagaan) dan statistik inferensial (analisis normalitas, homogenitas, dan perbedaaan rata-rata) berbantuan Aplikasi *SPSS for Windows 25*. Penelitian telah menghasilkan sebuah buku ajar digital yang berjudul Buku Ajar Prekursor Gempa Bumi Alami dan Hewani (BA PGAH) dengan format *3D Flip Page*. Kebaruan BA PGAH adalah *1)* muatan eskplanasi ilmiah fenomena alam dan perilaku hewan penanda gempa bumi yang selama ini merupakan pengetahuan lokal yang belum termanfaatkan untuk literasi dan kesiapsiagaan bencana, dan *2)* pengembangan muatan/isi BA PGAH menggunakan pendekatan multidisiplin ilmu Geografi, Kimia, Fisika, dan Biologi, dimana sebelumnya materi pendidikan kebencanaan terkonsentrasi pada satu bidang kajian. BA PGAH memiliki *1)* tiga karakteristik fungsional, *2)* kerangka materi yang sistematis, dan *3)* validitas, tingkat keterbacaan dan praktikalitas yang baik. Temuan penelitian menunjukkan *1)* kompleksitas konten dan keterpaduan isi mensitimulasi empat strategi membaca serta mempermudah pemahaman meskipun materi belum familiar, *2)* BA memotivasi pengembangan kompetensi pedagogik mahasiswa calon guru untuk pembelajaran prekursor bencana di SMP, *3)* BA PGAH dapat digunakan dalam pembelajaran adaptif bencana, *4)* berperan dalam peningkatan pengetahuan, respon dan keyakinan epistemik secara efektif, *5)* menstimulasi 3 kompetensi literasi sains dan 6) tingkat kesiapsiagaan mahasiswa yang berasal dari daerah non-rawan bencana lebih tinggi daripada mahasiswa dari daerah rawan bencana. Peneliti merekomendasikan perlunya *tools* dan *emotional scaffolding* untuk mengoptimalkan pemahaman dan kemampuan pemecahan masalah. Secara keseluruhan, hasil penelitian mengimplikasikan peluang *1)* kajian lanjut tentang *thinking skills, 2)* integrasi teknologi *augmented* dan *virtual reality, 3)* pengembangan inkuiri ilmiah untuk pengetahuan prosedural, dan *4)* pengembangan materi prekursor pada topik bencana selain gempa bumi.

Kata Kunci: Buku ajar mahasiswa, Literasi bencana, Kesiapsiagaan, Pembelajaran IPBA, Prekursor kearifan lokal gempa bumi

Developing of Textbook "Earthquakes Precursors" to Enhance the Literacy and Preparedness of Science Education Students

ABSTRACT

The global agenda on Sustainable Development Goals (SDGs) and the Hyogo Framework Action (HFA) reflects the high demands for the implementation of disaster education to achieve the goal of improving the lives of the world community by 2030. West Sumatra is a region with a very high risk of earthquakes but the implementation of education programs. Disaster Risk (DRR) has not been maximized in Higher Education, which is indicated by low levels of disaster literacy and disaster preparedness for students. The reason is that the availability of contextual lecture literature sources that contain the knowledge of local disaster knowledge is still limited. One solution is to provide learning resources that support the implementation of basic education in disasters. To accommodate the potential role of science and science education for disaster, this research aimed to produce a text book on natural precursor of earthquakes (BA PAG). The textbook development research uses the development research method with the DDR (Design and Development Research) design consisting of 3 main stages, namely front end analysis, planning (design), and production (development) and 17 steps of activities. Overall, the research was carried out in West Sumatra in 2 sub-locations, namely the Science Education Study Program of the Universitas Negeri Padang and four disaster-prone areas in West Sumatra. The data is collected using various techniques (observations, surveys, interviews, literature analysis, and tests) and valid instruments (observation sheets, questionnaires, interview guides, checklists, and tests). Data analysis applies two techniques, namely descriptive statistics (percentage calculation, N-gain determination, preparedness index) and inferential statistics (analysis of normality, homogeneity, and average differences) assisted by the SPSS for Windows 25. The research has produced a digital textbook entitled Textbook of Natural and Animal Earthquake Precursors (BA PGAH) in 3D Flip Page format. The novelty of BA PGAH are 1) it's content contain scientific explanation of natural phenomena and the behavior of earthquake markers, which have so far been local knowledge that has not been utilized for literacy and disaster preparedness, and 2) the development of the content of BA PGAH using a multidisciplinary approach consist of Geography, Chemistry, Physics, and Biology, where previously disaster education material was concentrated in one field of study. BA PGAH has 1) three functional characteristics, 2) a systematic material framework, and 3) good validity, readability, and practicality. The research findings show 1) content complexity and content integration simulates four reading strategies and makes it easier to understand even though the material is unfamiliar, 2) BA PGAH motivates the development of pedagogical competence of prospective teacher students for learning disaster precursors in junior high school, 3) BA PGAH can be used in disaster adaptive learning, 4) play a role in increasing knowledge, response and epistemic beliefs effectively, 5) stimulate 3 scientific literacy competencies and 6) the level of preparedness of students from non-disaster prone areas is higher than students from disaster-prone areas. Researchers recommend the need for tools and emotional scaffolding to optimize understanding and problem-solving abilities. Overall, the research results imply opportunities for 1) further study of thinking skills, 2) integration of augmented and virtual reality technology, 3) development of scientific inquiry for procedural knowledge, and 4) development of precursor material on disaster topics other than earthquakes.

Keywords: College students' text book, Disaster literacy, preparedness, Earth science learning, Earthquakes local wisdom precursor

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